ADVANCED PLANT BREEDING

Advanced plant breeding

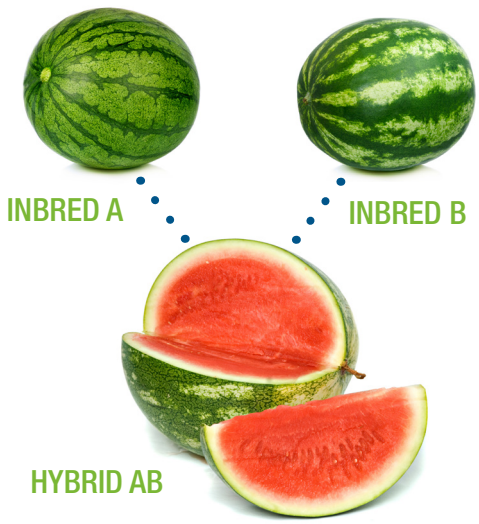
Plant breeding is the art and science of improving agricultural plants for the benefit of mankind. Crop breeding is a rapidly advancing science, using genetic and biological innovations to efficiently develop better crop varieties.

Mixing together for BIGGER AND BETTER

When two related plants with desirable traits are bred together, their offspring are often bigger and boast higher yields. This is called heterosis or hybrid vigour.

The hybrid effect only lasts one generation, but the benefits are so great that farmers are willing to buy new seed each year. Most corn in the U.S. is grown from hybrid seed and there are hybrid canola varieties available. There are many hybrid garden vegetable and flower seeds available on the market as well.

HETEROSIS or HYBRID VIGOUR



Seedless watermelons are created by crossing a diploid watermelon, or one with 22 chromosomes per cell, with a tetraploid watermelon, which contains 44 chromosomes per cell. **The result is a sterile, seedless watermelon.**

Let's do this the **EASY** way

To produce a hybrid crop, you have to take pollen from the stamen (male part) from one plant and put it onto the pistil (female part) of another plant to fertilize it so it starts growing seed.

If you grow two rows of corn of different varieties and remove the tassels from one row this will ensure that the silk will be pollinated by the tassels from the other row. The corn that will develop will be a hybrid.

Crops like tomatoes are more tricky. Since their flowers contain both stamen and pistil they can fertilize themselves. Plant breeders use tweezers to physically pluck the stamens from the blossoms – a time-consuming process that demands patience and a steady hand.

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Third Cousins, Twice Removed

It's fairly easy to breed closely related plants but it gets more difficult the further they are apart, or what plant breeders call "wide crosses."

Wheat (Triticum aestivum) is not only a different species but a different genus from rye (Secale cereale). Wheat has good yields, while rye is tougher – able to withstand greater environmental pressures.

When plant breeders fertilized wheat with rye pollen, they got plants, but they were sterile and couldn't reproduce.

Using lab techniques, they were able to create fertile seeds of a new wide-cross, hybrid crop: triticale. It yields more than wheat, but its baking and nutritional qualities are different so it's mostly found in some breakfast cereals and some health foods.

Wide crosses are also used to bring in traits such as disease resistance or drought resistance from wild relatives of crops.

Rio Red Grapefruit

MUTANTS TO THE RESCUE

Another way of getting traits we want into our crop plants is mutagenesis, or mutation breeding. In the mid 20th century, researchers learned to expose seeds to chemicals or radiation and cause mutations – changes in the plants' genetic code - essentially harnessing evolution.

If they're lucky, the mutations yield traits they're after. Breed the desirable mutation into the crop (and breed out the undesirable traits that came along for the ride) and they've got the beginnings of a new variety.

Traits, such as novel colour and sweeter flavour (Rio Red grapefruit) have been produced this way. It's a hit-and-miss process, but it works well. Thousands of varieties of food plants have been produced this way, including wheat, barley, grapefruit, pears and bananas.

ENGINEERING CROPS

Researchers have developed crops by moving genes from an unrelated organism into the crop plant **(transgenics)** or by changing the plant's own genes **(cisgenic)**. Traits such as insect resistance in corn, eggplant and other crops, as well as non-browning apples and potatoes are developed this way.

These crops are often called GMOs (for "genetically modified organism") but since the genes of virtually everything we eat have been modified somehow just by being domesticated, this is not a very useful term. "Genetically engineered," or GE, is more accurate.